

WHAT IS CLAIMED IS:

- 1 1. A phase-shifting mask for a photolithographic process,
2 comprising a transparent material having first and second trenches, the
3 first trench having a first depth and the second trench having a second
4 depth deeper than the first depth.
- 1 2. The phase-shifting mask of claim 1, wherein the first depth is
2 suitable for phase-shifting light having a first wavelength and the second
3 depth is suitable for phase-shifting light having a second wavelength
4 longer than the first wavelength.
- 1 3. The phase-shifting mask of claim 2, wherein the first depth is
2 suitable for phase-shifting the first light by 180 degrees and the second
3 depth is suitable for phase-shifting the second light by 180 degrees.
- 1 4. The phase-shifting mask of claim 2, wherein the first depth is
2 suitable for phase-shifting light having a wavelength of 248 nm by 180
3 degrees.
- 1 5. The phase-shifting mask of claim 1, wherein the transparent
2 material includes a first region of trenches including the first trench, the
3 first region of trenches including a plurality of trenches having the first
4 depth, wherein the transparent material includes a second region of
5 trenches including the second trench, the second region of trenches
6 including a plurality of trenches having the second depth.
- 1 6. The phase-shifting mask of claim 5, wherein the first region
2 comprises at least one-fourth of the surface area of one side of the
3 transparent material and the second region comprises at least one-fourth
4 of the surface area of the one side of the transparent material.

1 7. The phase-shifting mask of claim 5, wherein the first region
2 comprises approximately one-half of the surface area of one side of the
3 transparent material and the second region comprises approximately one-
4 half of the surface area of the one side of the transparent material.

1 8. The phase-shifting mask of claim 1, further comprising an
2 opaque layer fabricated on the transparent material, the opaque layer
3 representing a printed circuit pattern.

1 9. A phase-shifting mask for a photolithographic process

2 manufactured by the steps of:

3 providing a transparent material;

4 patterning a plurality of first trenches in the transparent
5 material, the first plurality of trenches having a first depth;

6 providing a resist layer over a portion of the transparent
7 material; and

8 etching a plurality of second trenches in the transparent
9 material until the second trenches has a second depth deeper than the
10 first depth.

1 10. The phase-shifting mask of claim 9, wherein the resist layer
2 covers a first subset of the first trenches and leaves a second subset of
3 the first trenches exposed, wherein the second subset of first trenches
4 are etched to form the second plurality of trenches.

1 11. The phase-shifting mask of claim 9, wherein the resist layer
2 covers at least one-fourth of one side of the transparent material.

1 12. The phase-shifting mask of claim 9, wherein the resist layer
2 covers approximately one-half of one side of the transparent material.

1 13. The phase-shifting mask of claim 9, further comprising
2 patterning an opaque layer over the transparent material.

1 14. The phase-shifting mask of claim 9, wherein the first depth is
2 suitable to phase-shift a first wavelength of light passing through the first
3 plurality of trenches by 180 degrees and the second depth is suitable to
4 phase-shift a second wavelength of light passing through the second
5 plurality of trenches by 180 degrees.

1 15. A method of testing the effect of lights having different
2 wavelengths on a layer of photoresist, comprising:
3 providing a phase-shifting mask having a transparent material
4 having first and second trenches, the first trench having a first depth and
5 the second trench having a second depth deeper than the first depth;
6 transmitting light having a first wavelength through the first
7 trench to the photoresist layer;
8 transmitting light having a second wavelength longer than
9 the first wavelength through the second trench to the photoresist layer;
10 and
11 comparing an effect on the photoresist layer of the light
12 having the first wavelength to an effect on the photoresist layer of the
13 light having the second wavelength.

1 16. The method of claim 15, wherein the first depth is suitable
2 for phase-shifting the light having the first wavelength and the second
3 depth is suitable for phase-shifting the light having the second wavelength
4 longer than the first wavelength.

1 17. The method of claim 16, wherein the first depth is suitable
2 for phase-shifting the first light by 180 degrees and the second depth is
3 suitable for phase-shifting the second light by 180 degrees.

1 18. The method of claim 16, wherein the first depth is suitable
2 for phase-shifting light having a wavelength of 193 nm.

1 19. The method of claim 15, wherein the transparent material
2 includes a first region of trenches including the first trench, the first
3 region of trenches including a plurality of trenches having the first depth,
4 wherein the transparent material includes a second region of trenches

5 including the second trench, the second region of trenches including a
6 plurality of trenches having the second depth.

1 20. The method of claim 19, wherein the first region comprises
2 at least one-fourth of the transparent material and the second region
3 comprises at least one-fourth of the transparent material.

1 21. The method of claim 19, wherein the first region comprises
2 approximately one-half of the transparent material and the second region
3 comprises approximately one-half of the transparent material.

1 22. The method of claim 15, wherein the phase-shifting mask
2 includes an opaque layer coupled to the transparent material, the opaque
3 layer representing a printed circuit pattern.